

The Place of PRP and PRF Methods for Trophic Ulcers Treatment in Patients with Decompensation Stages of Varicose Veins in Combination with RFA

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ABSTRACT

45 patients with varicose disease of the lower extremities at the stage of decompensation (C6 according to the CEAR classification) were under observation. Among them there were 34 women, 11 men, at the age of 45 ± 46 years old. The size of the trophic ulcers was from 2.5×1.5 to 8.5×7.5 cm, the duration of them was on average up to 8 months. The complex clinical, morphological, bacteriological examination of the trophic ulcers has been carried out to all patients treated. To objectively evaluate the dynamics of reparative processes in trophic ulcers, the MEASURE system was used, as well as the determination of the regenerative-degenerative index before and after the PRP, the PRF was made. For PRP and PRF, the plasma-enriched growth factors (PRGF®-ENDORET®) was prepared according to the protocol of the BTI Institute of Biotechnology (Victoria, Spain). Injections were performed on the periphery of the trophic ulcer. Then the surface of the ulcer was covered with a plasma (fibrin) membrane enriched with growth factors. This made it possible to accelerate the appearance of granulation tissue and marginal epithelization in the trophic ulcer and significantly increase the number of cells responsible for reparative processes (macrophages, fibroblasts, polyblasts).

Keywords

Varicose disease, Ulcers, PRP and PRF.

Introduction

The varicose veins are the most common vascular disease of the lower extremities. Its frequency among the population varies from 9.3 to 25%. In Europe, the disease is diagnosed in 10% of the adult population. The annual growth rate of varicose veins of the lower extremities (VVLE) reaches 2.5%. Chronic venous insufficiency is an important socio-economic problem. In recent years, the tendency to the disease growth among the working age people has been admitted. As a result, the number of complicated forms of illness and persistent disability are increasing from year to year.

For many years, classical safenectomy is the traditional method of treating VVLE.

Over the past decade, new technologies for treatment of VVLE have been actively implemented by surgeons, in particular, laser and radiofrequency ablation of veins (RFA), which are slightly

traumatic, with a good cosmetic effect. RFA, due to its technical execution, its relative simplicity, and effective functional results, is gaining more and more supporters in the USA and Europe. However, despite the widespread use of RFA in clinical practice, a number of unsolved issues remain. Data on the effectiveness of using RFA in patients with trophic ulcers (in the stage of decompensation of VVLE) are controversial. In this regard, indications for the use of RFA in this category of patients are not clear. The technology for its implementation and analysis of possible complications have not been properly developed. It should also be emphasized on the issue of an individual approach to choosing the method of performing RFA according to the clinical, anatomical and ultrasound data in patients with decompensated form of VVLE. From scientific and practical points of view, the answer to the question about effectiveness of the use of other modern non-invasive technologies in combination with RFA for treatment of patients with VHCs in the stage of decompensation is interesting. In this regard, the development of effective methods for accelerating the venous ulcers healing in order to reduce the time of treatment and improve the quality of life is relevant.

The aim of the study is to give a clinical substantiation of the use of PRP and PRF methods in combination with radiofrequency ablation for treatment of patients with varicose veins, complicated with a trophic ulcer.

Materials and Methods

45 patients with varicose disease of the lower extremities at the stage of decompensation (C6 according to the CEAR classification) were under observation. Among them there were 34 women, 11 men, at the age of 45 ± 46 years old. The size of the trophic ulcers was from 2.5×1.5 to 8.5×7.5 cm, the duration of them was on average up to 8 months.

Ultrasound diagnosis to assess phlebothromodynamic disorders in the limb was carried out for all patients. The ultrasound of the venous system of the lower extremities was performed on Vivid 3 device (General Electric, USA) with a 5-10 MHz probe and the corresponding standard software package of the same firm for the venous system examination. Patients were examined in the afternoon in a vertical and horizontal positions. During ultrasound procedure blood flow in veins, diameters and forms of the veins lumen, their deformation and transformation, veins wall thickness, elasticity of the valves and their function during functional tests, blood reflux presence, duration of retrograde flow through the venous lines and its distribution to the anatomical segments, the state of the sapheno-femoral and sapheno-popliteal junctions were examined. We paid special attention to location of perforated veins, to determine their diameter and duration of venous blood reflux.

Evaluation of the state of trophic ulcers at the beginning and in the process of treatment was performed for all patients with the help of MEASURE system. It includes measurements of length, width, depth, ulcer area, amount of exudate and evaluation of its nature, appearance of the wound's bed, pain sensation, presence or absence of necrosis of tissues, the condition of the edges of the wound and surrounding tissues. The area of the trophic ulcer at the beginning of treatment and after treatment was determined by a transparent film using the copy method. The level of epithelization was determined using the method of plinyometry of the ulcers before the beginning of PRP, PRF procedure and in 4, 8, 12 days after it. The level of the ulcerative defect epithelization was calculated using the formula $S-S_n / t$, where - S is the initial area of ulcer before treatment, S_n is the area of the next measurement, t is the number of days between measurements. The dynamics of healing wound was determined by cytological analysis of the cellular composition of the ulcer defect by the imprints method. The regenerative-degenerative index was used to evaluate the degree of manifestation of degenerative and regenerative processes in the ulcer. Cytological parameters were studied at the moment of hospitalization and in 5-6, 8-9 days after the application of PRP, PRF. The intensity of the pain syndrome was determined by the Numerical Rating Scale (NRS).

For PRP therapy, plasma-enriched growth factors (PRGF®-ENDORET®) were prepared in accordance with the protocol of the BTI Institute of Biotechnology (Victoria, Spain). F2 fraction was removed and injections were performed on the periphery of

the trophic ulcer (Figure 1).



Figure 1: Injection of the plasma over the periphery of the ulcer.

For PRF therapy, the patient's blood was centrifuged in test tubes with a plasma activator at a rate of 3000 rpm with a duration of 10-12 minutes. Tubes in a centrifuge were placed at an angle of forty degrees. The received blood plasma bundle was transferred to the PRF-Box for 10-15 minutes to obtain the fibrin membrane. The prepared fibrin membrane was used to treat the surface of the trophic ulcer (Figure 2).



Figure 2: Coverage of the trophic ulcer surface with a plasma membrane.

According to ESVS protocols, with the help of VNUS-Closure FAST method, RFA was used to eliminate vertical blood reflux on the superficial venous system.

It was done with the help of COVIDIEN high-tech device of Medtronic Company.

The clinical severity of venous pathology in the context of a trophic ulcer was assessed on a venous clinical severity score (VCSS). All patients had clinical symptoms of chronic decompensated venous insufficiency: edema, pain syndrome, skin induration, trophic ulcer.

Results

Already after one PRP and PRF session that was conducted simultaneously with RFA, there was a reduction of pain in the area of the trophic ulcer, normalization of body temperature, and sleep. In addition, the area and depth of wound in patients decreased by 23,1%, 37,4% and 79,9%, respectively, on 5-6, 8-9, 12-14 day, in comparing with initial data. Also, the decrease in perifocal edema and skin hyperemia around the wound was observed in the majority of patients on the third day of treatment.

It was noted that the average time of granulation tissue appearance in these patients was on (3.74 ± 1.65) day, and the beginning of marginal epithelization – on (3.2 ± 1.44) day ($p < 0.05$). The results of cytological studies show that the application of the above-mentioned technologies leads to the decrease the number of cells that determine the acute phase of inflammation (neutrophils, lymphocytes, monocytes) and growth the number of cells responsible for the reparative processes (macrophages, fibroblasts) in wounds. Thus, there was the decrease in the content of neutrophils and lymphocytes in inflamed cells in patients on the 2nd and 3rd day, and on the 4th-5th day - in all cells of inflammation. This corresponds to the transition of the degenerative - inflammatory type of inflammation to the inflammatory - regenerative type of the cytogram. Changing the nature of cytograms for regenerative-inflammatory type is noted in the majority of patients on the eighth day. Dentrites and microbial bodies disappear. Productive epithelization is a characteristic feature. This made it possible to conduct a complete RFA of veins. The elimination of horizontal reflux in the area of trophic changes was additionally performed in 22 patients by using sclerotherapy of inoperable perforated veins under ultrasound navigation.

Discussion

After the application of PRP and PRF technologies, the regeneration process in trophic ulcers has been significantly intensified. Also, the use of these technologies has made it possible to reduce significantly the severity of the varicosity on the fifth day of observation from 12.2 ± 1.4 to 7.3 ± 1.6 according to the VCSS scale.

The positive moment of these manipulations is rapid activation of patients and postoperative rehabilitation. It should also be noted that 39 (86.6%) patients had an autodermoplasty of the ulcer, while in other 6 (13.4%) patients the trophic ulcer was healed independently.

Conclusion

The use of PRP in combination with PRF with radiofrequency ablation of veins is a promising direction in the treatment of varicose disease of the lower extremities, complicated by a trophic

ulcer. This creates a possibility to reduce the pathology, treatment, and rehabilitation time of patients. The use of such non-invasive technologies allows performing surgical interventions for varicose veins, complicated by trophic ulcers in outpatient settings.

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